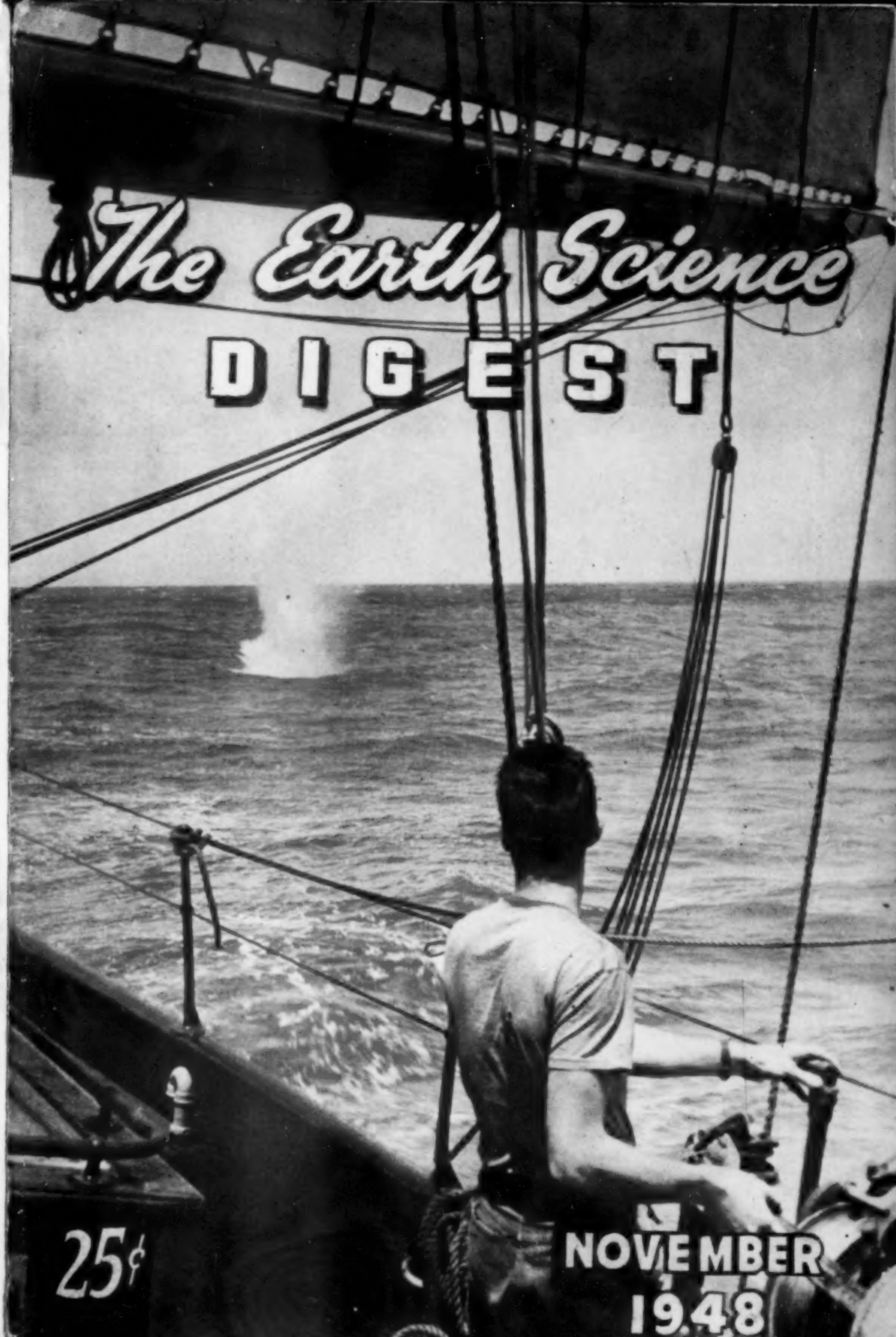

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Contents

A PROPOSED FIVE YEAR PROMOTIONAL PLAN for the ADVANCEMENT OF GEOLOGIC EDUCATION IN AMERICA

Ben Hur Wilson
Joliet Jr. College

1st Year: 1949 — **A comprehensive survey** of the extent and current pedagogical practice of **geologic education in America,** to be made under competent auspices, together with a study of and agreement on a plan of organization; the selection of committees and chairman, and the recruiting of promotional personnel looking toward furtherance of the Five Year Plan.

2nd Year: 1950 — **An evaluation of survey** and critical appraisal of entire situation, attempting to account for the general absence of geologic education and possible methods of reversing such trends.

3rd Year: 1951 — Development of a **promotional plan** for the **advancement** of **Geologic education** and determination of all possible methods and means for putting them into practice. Setting up office facilities with permanent secretary in charge.

4th Year: 1952 — Intensive campaign of **publicity** and **promotion,** for carrying out the promulgated Plans. Establishment of statistical survey for determining progress made.

5th Year: 1953 — Continuation of promotion and analytical survey looking towards a second Five Year Plan to follow. Publication of comprehensive report on the progress made, with recommendations for future action.

WHY A FIVE YEAR PLAN?

The question may arise in the minds of many as to why we should pursue a **Five Year Plan,** in the promotion of geologic education in America. To some this may seem like a very long time, — too long to wait for result.

As a matter of fact, this period will be altogether too short to accomplish all of the ends and objectives we are seeking.

The mere physical organization of committees and sub-committees is a matter which will move very slowly. All this will take planning and correspondence which cannot be done in a day. Decisions will have to to be made and leadership recruited, all of which will require much time.

To promote a demand for geologic education, without the teaching facilities to handle it would be of no avail, and with poor and inadequate instruction there would surely be a "kick back." which would do the movement no good. The matter of preparing and building up of a teaching force alone would require four or five years of college education, even though we were immediately ready to begin.

By this, we do not mean that some, indeed much, advancement cannot be made as we go along with the plan. Even without any planning or concerted effort, whatever, I dare say that just the natural growth of interest in the subject will be considerable and will accelerate as the years go by — just on the principle that you "can't keep a good thing down." Without doubt, should our movement get under way and off to a good start, just the publicity and the enthusiasm engendered hereby will augment this natural progress to a greater degree than we anticipate.

What we are vitally concerned with now, however, is, whether we are going to attack this problem with a great concerted effort, all forces pulling together and moving forward steadily on a broad front, or whether we each in our own more or less feeble way will be content to do what we can, and trust largely to wishful thinking to obtain our desired results.

In this, we are throwing the matter open for debate and earnestly invite discussion or correspondence on any phase of the question from any source whatsoever, which may be addressed either to the Editor of The Earth Science Digest, or the writer of the present article, who takes no particular credit for the idea, since he knows it has long been on the minds of many other friends of geologic education.

COVER PHOTO

By exploding a small bomb astern the Atlantis, ship of the Woods Hole Oceanographic Institution, and timing the returning echoes, the thickness of the sedimentary carpet on the ocean floor can be determined.

Read "New Light on Sub-ocean Geology" on pages 18-19. A Science Service photo.

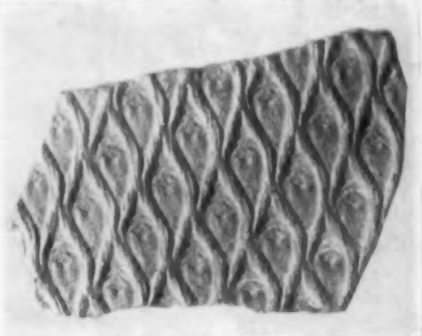
Coal Age Flora of Northern Illinois

FRANK L. FLEENER
Joliet Jr. College

To the majority of folks the word "coal" simply suggests a pile of dirty black lumps that have been dug from the earth to be burned to furnish heat for the homes or energy for the shops or factories; but as W. T. Thom, Jr., in his book, "Petroleum and Coal," puts the matter, "to one who really knows and appreciates coal, it outrivals the tarnished lamp which Aladdin rubbed with such amazing results". Coal is not merely a rock but the potential power that has helped man to achieve a stage of civilization quite impossible without its aid. In fact, it has become man's chief ally in his conquest of the physical world, the driver of his machinery, the equalizer of climatic extremes, and the raw material of a thousand useful products from aspirin to roofing tar.

The Pennsylvania period presented an aspect quite different from anything seen previously or since that time. There were no grass-covered prairies, no hillsides with their slopes covered with flowering plants in summer, no forests of broad-leaved flowering trees and shrubs, such as we see in our modern forests. None of these had as yet made their appearance. The abundant vegetation that then existed was made up of low order, flowerless plants, such a horsetails (equisetiae), ferns, and clubmosses, now represented by insignificant plants but then forming a great and luxuriant flora.

Vast swamp forests of this type of vegetation covered much of the continents of Europe, Asia, and North America. The Mississippian period came to a close with an uplifting of the land above the sea,



Bark of the Lepidodendron, ancient relative of the present day club moss.

upon which active erosion began to work, carrying away much of the older sediments to the sea. It is a notable fact that the majority of the sediments deposited during the Pennsylvania period were of a contenental type, consisting mostly of a series of flood-plain, alluvial fan, and swamp deposits. Much of this detrital material apparently was derived from a large land mass called Appalachia, situated to the east of our present eastern shoreline, now submerged.

As a consequence of long-continued erosion and transportation from both east and west, an enormous amount of clastic material,—about a mile thick—, was deposited in this geosyncline. This great thickness of sediments brought so much weight to bear upon the earth's crust as to cause it to subside from time to time, eventually resulting in the disruption of the crust and the formation of the Appalachian Mountains. Moreover, much similar material was deposited over extensive peneplained areas and swampy alluvial flats, which sloped gently westward and as far north as Alaska.

The climate of the Pennsylvanian period was likewise quite unique and difficult to explain. The flora of the period consisted of trees and plants that compare closely with those which we now find in our tropical regions. By inference, this denotes a warm climate. Also, the absence of annual growth rings in the tree-trunks is suggestive of very uniform growing conditions, without the interruptions caused by the seasonal changes such as are so familiar to us in the Northern Hemisphere. A further interesting fact is indicated by the great extent of the coal deposits of the Pennsylvania period, which extend from near the North Pole down into the Temperate Zone. Coal deposits of this period occur in Alaska, Greenland, Spitzbergen, and Siberia. It would appear, therefore, that this long period of uniformly mild climate must have existed over a vast area, at least in the Northern Hemisphere, and to have persisted for a very long period of time, probably near fifty million years.

Fern plants have long been recognized as the predominating form of plant life of the Pennsylvanian period. However, we now know that many of these so-called ferns were not true ferns. The means of spores that develop in little cases (sorii), to be seen in ferns of our time reproduce by

Mariopteris muricata, a fossil fern.
Photo courtesy of Illinois State Geological Survey

Alethopteris serlii, a fossil fern.
Photo courtesy of Illinois State Geological Survey

season attached to the underside of the frondlets. On the other hand, most of the ferns of the Coal Measure time reproduced by nut-like seeds, after the manner of our modern gymnosperms. These seeds often occur as nuclei enclosed in the nodules, and for a long time paleobotanists wrongly considered them as spore cases.

Besides the ferns and seed-ferns that were prolific in the lush Coal Age forests, there were giant bamboo-like rushes, called Calamites. These often grew to heights in excess of fifty feet, and, like their modern descendents, the equisetiae, grew profusely in boggy places. The stems show a jointed arrangement, with the leaves always borne in whorls around the stems at their joints. Like the modern horsetails, the reproductive spores were borne in cone-like structures at the tips of the branches.

Coal Age trees were often of great size, attaining a height of a hundred or more feet. These giants of the Coal Age forests were mere shells of woody material filled with pith. Quite contrary to our preconceived notions on the matter, these giant trees were reproduced by spores, and may rightly be classed as tree ferns. The principal representatives of these tree fern giants were the Lepidodendrons, whose bark was covered with diamond-shaped scars, and the Sigillarias, with vertical rows of leaf scars on their trunks. These scars represent the points of attachment of leaves that have fallen away. The leaves were long and grass-like, and borne in clusters at the tips of the branches. As the branches grew, new leaves came out at the tips, and the lower leaves were shed, leaving the scars.

In one respect the Lepidodendron trees resembled trees of our

The culm piles southwest of Wilmington, Illinois, were very prolific sources of fossils. Literally thousands of the fern nodules were exposed on these ridges.

Photo by Larry Schuck

time. They were branched, but in a peculiar manner, each branch dividing into two smaller ones, etc. The spore-bearing cones were borne on the tips of the branches. The flower - like spore - bearing organs were surrounded by stiff bracts, many of which are to be found in the nodules. On the other hand, the Sigillaria trees did not branch, but bore at the top of their ninety foot trunks a cluster of spear-like leaves, some of which were six feet long. In this respect these trees resembled our present-day palms.

The undergrowth existing in these primitive forests was so lush that it would have been quite impossible to penetrate it for any distance. Besides the true ferns, there were the Seed-ferns, which greatly outnumbered the true ferns. These apparently occupied a position between the ferns and true seed-bearing plants. This group has been classified as Cycadofilicales. These were represented by many species of herbaceous plants; some were climbers (vine-like), while some attained the proportions of small trees similar to our tree ferns of the Tropics. Fossils of the coal-forming plants are found in great profusion in the ironstone nodules of Northern Illinois and have been the means of giving us accurate knowledge concerning their forms and the nature of their habitat.

In order to glimpse the conditions under which these nodules had their inception, it is necessary for us to recapitulate some of the aforementioned geology. At that remote period the entire interior of the United States was covered with a vast, shallow, jungle-like, swampy area. This condition persisted for a very long period of time, probably near fifty million years, during which time there was a slow accumulation of vegetable remains in the bottom of the swamps. Anerobic bacteria were at work, macerating the plant

Sphenophylum emarginatum, a fossil member of the genus Equisetiae now represented by the horsetail or scouring rush. Photo courtesy of Illinois State Geological Survey fibers and slowly preparing them for the change into coal.

When this vegetable muck, which we know as peat, had reached a thickness of perhaps a hundred feet, a change finally occured. The earth's surface, long quiet, shuddered and yielded under the forces of great internal stresses. The land suffered a period of subsidence, and that portion of the swamp now represented by the coal seam was well under water. Simultaneously the upland areas were raised, accelerating the flow of the streams, so that much sediment was carried into the shallow estuary, burying the muck to a considerable depth. Scattered throughout this muddy material, plant fragments, washed in by the streams were imbedded, which in time became the nuclei of the numerous nodules, or concretions, as some call them.

The next step in the formation of these peculiar fossil-bearing nodules came about through the emergence of the mud bed from the ocean and its transformation into shale. No doubt, all this consumed an immense period of time, during which the buried plant remains, locked away from the oxygen of the air, were undergoing a peculiar process of decay by which they were slowly turned into coal. Various forces of nature were at work. Underground water percolating through the shales dissolved mineral matter, which it brought into contact with the decaying plant material, where complicated chemical reactions took place that resulted in the formation of new minerals in the immediate vicinity of the plant material. This series of chemical reactions and resulting changes in the minerals caused the shale in the affected area to become more closely cemented than elsewhere, forming the clay ironstone nodule.

These nodules occur in all sizes and shapes, from those a half-inch in diameter to an occasional specimen twenty or thirty inches in length. The shape and size of the resulting nodule is governed by the shape and size of the plant fragment. The smaller nodules are

Annularia stellata, a fossil member of the genus Equesetiae.
Photo courtesy of Illinois State Geological Survey

Neuropteris rarinervis, a fossil fern.
Photo courtesy of Illinois State Geological Survey

usually found to contain a small leaflet or a fragment of plant material, while the larger and more desirable ones contain more complete plant remains, such as fern fronds, or a tree branch, or a portion of a plant stem. Besides the great variety of plant remains thus preserved, various other kinds of organisms are also found in nodules, such as insects, worms, shrimps, crayfish, snails, clams, and even bones of amphibia. However, specimens of these unusual forms are comparatively rare, and when found are considered prizes. Not all of the nodules contain fossils; some may have a bit of calcite, pyrite or even sphalerite as the nucleus.

The most desirable fossils occur where an isolated fragment of a plant acted as a nucleus, around which a concretion developed. It is noticeable that the influence of the chemical reactions usually radiated away from the nucleus quite equally in all directions, causing the nodule to assume roughly the size and shape of the enclosed plant remains. This becomes a material aid to the collector in selecting nodules for splitting. There are fewer duds.

As previously stated, the chief value of these fossils lies in the clues they furnish as to the kinds of plants that entered into the formation of the coal of Pennsylvanian age. A check of these fossils shows that they represent nearly fifty species of fossil plants. Janssen, however, says, "This does not mean necessarily that an equal number of Coal Age plants are represented". He goes on to explain that it is quite a different matter for a botanist to analyze and classify a living plant, than it is to deal with an ancient plant, whose shattered fragments are scattered widely through the rocks. Complete specimens of fossil plants are extremely rare, hence the mistakes in identification are bound to occur, and different parts of the same plant will bear different names. Only time and the finding and study of larger and more complete specimens will clarify the situation.

The Mazon Creek fern nodules are quite unique; nowhere else has anything comparable to them been found. Their uniqueness possibly has been largely responsible for their popularity, which extends back for many years. There seems to be no certain record of their discovery, for the first recorded investigation of the area was made by Joseph Evans in 1857. Loe Lesquereux, a Swiss paleobotanist, became intensely interested in these fossils and used many of them as types while compiling his work on the plant fossils of Illinois. This work was published in 1866, as volumes 2 and 4 of Dr. Worthen's report. In those olden days the fern nodules could be collected in two places, east of Morris, Illinois, where the Mazon Creek had cut through the nodule-bearing shales. Collecting was slow and laborious in those days, but this is all changed now, because the strip mining process, by its overturning of the earth, has exposed literally thousands upon thousand of these fossil-bearing nodules, which await the coming of the collector with his bag and hammer.

These beautiful plant impressions, so miraculously preserved for our edification, have been fittingly called, "The Creator's Herbarium", and they have become well-known wherever the science of geology is taught, because of the story that they tell concerning the conditions that existed during the Coal Measure period and their connection with the formation of the coal beds upon which our well-being so definitely depends.

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The Earth Sciences — 1948

by Science Service

NEW URANIUM MINERAL FOUND IN BELGIAN CONGO

NEW YORK, Oct. 4 — A new radioactive mineral containing the atomic bomb element, uranium, has been discovered in Africa and identified here.

The newly-discovered mineral was found in the Belgian Congo. J. F. Vaes, of Union Minere, Jadotville, Begian Congo, sent samples to Dr. Paul F. Kerr, Columbia University geologist, here.

Laboratory tests by Dr. Kerr showed that the material is a previously unknown uranium mineral. It has been named "sengierite," in honor of Edgard Sengier, who directed wartime mineral production in the Belgian Congo.

Sengierite is found in small green crystals which cling to a chlorite-talc rock found in mines in the Belgian Congo. It is similar to the American uranium mineral, carnotite, except that sengierite is a copper uranium mineral, while carnotite is a potassium uranium material.

OIL SHALE MAY BE LIMESTONE, MARLSTONE OR DOLOMITE, NOT TRUE SHALE

AMARILLO, Texas, Oct. 6 — Oil shale, important raw material to furnish fuel oils as petroleum deposits approach exhaustion, is not always a true shale, and it does not contain oil, the American Society of Mechanical Engineers was told here today by Tell Ertl, Union Oil Company of California, Rifle, Colo.

Oil shale is a sedimentary rock containing organic matter insoluble in ordinary solvents but capable of yielding an oil on heating. Some is a true shale since its inorganic matter is argillaceous, that is, composed of clay, but in many inorganic matter is calcareous or dolomitic. These should be called marlstones, limestones, dolomites or magnesian marlstones. The Green river oil shale of Colorado, Utah and Wyoming is a magnesian marlstone.

The organic matter in oil shale is a solid known as kerogen, that probably consits of a mixture of compounds of carbon, hydrogen, oxygen, nitrogen and sulfur, he stated. On heating oil shale to a temperature above 750 degrees Fahrenheit, the kerogen is cracked into coke, gases condensable to an oil, and non-condensable gases.

Oil shale is found in most of the countries of the world and most of the states of the United States, he said. It was formed in lakes or seas in which the deposit of inorganic matter was slow and in which abundant organic matter lived or was accumulated. The organic matter of the better known oil shale deposits consists largely of macerated and putrefied microscopic vegetal organisms such as spore cases and algae. Larger vegetal matter, such as leaves and stems, and also animal matter, form part of the organic constituents of oil shales.

The most extensive oil shale deposit in the United States is the black shale of the Chattanooga formation, which is richest in Indiana, Ohio and Kentucky, though found also in 14 surrounding states. It will probably not yield over 15 gallons per ton for any large tonnage.

The richest oil shale deposit in America is found in the Green river formation of Colorado, Utah and Wyoming. It is in this region that the U. S. Bureau of Mines is recovering oil in its plant at Rifle, Colo. The oil shale is resistant to erosion and forms the tops of plateaus, one in each of these three states. The Piceance Creek Basin of northwestern Colorado contains the greatest thickness and highest grade of oil shale deposits known in the United States.

PETROLEUM INDUSTRY SPENDING MUCH MONEY IN DEVELOPING SYNTHETIC LIQUID FUELS

AMARILLO, Texas, Oct. 6—Synthetic liquid fuel production from natural gas, oil shale, tar sands and coal is a major problem with the petroleum industry, the American Society of Mechanical Engineers was told here today by R. C. Alden and Alfred Clark of the Phillips Petroleum Company, Bartlesville, Okla.

It is quite probable, they said, that more is now being spent on this one problem by the petroleum industry than was being spent on catalytic oil cracking ten years ago. In addition there is a very large government research and development program with which the private industry is in close touch. Under the total program it is to be expected that the petroleum industry will continue as the supplier of liquid fuels and the chief supplier of gaseous fuels, regardless of the raw materials from which these vital commodities are made.

Two giant plants are already in construction in the United States to convert natural gas into liquid fuels. Naural gas is an ideal fuel for practically every stationary use, they stated, and many are questioning the economic wisdom of diverting this ideal fuel from stationary uses to mobile uses by converting it to synthetic liquid fuels, a process that utilizes half its energy content. The answer seems to be market demands for liquid fuels, and that natural gas reserves have been increasing at a faster rate than the marketed production of natural gas, although this has been doubling every 11 years.

American research and development of the German Fischer-Tropsch process of making synthetic fuels has resulted in great improvements which make the gas synthesis operation appear in a favorable light as an economic source of liquid fuels, they declared. However, it requires very large investments, including the use of very large amounts of steel. A corresponding production of synthetic fuels from coal would take as much investment and nearly twice as much steel.

New gas synthesis plants will be put in at a slow rate until further process improvements are effected, they predicted. These may be expected from the two plants now being built and from numerous research programs under way.

JELLIED GASOLINE, WARTIME WEAPON, USED TO TRACK UNDERGROUND ROCK TO INCREASE OIL FLOW

DALLAS, Texas, Oct. 6 — A new process to crack rock thousands of feet under ground to permit the flow of oil pumped to the surface was revealed here today by Stanolind Oil and Gas Company at a meeting of the American Institute of Mining and Metallurgical Engineers. The process utilizes jellied gasoline, one of the war's most horrible incendiary weapons.

The jellied gasoline looks like thick mush. It is pumped into the well under very high pressure. It spreads through the underground rock formation and causes it to split and open up cracks through which the oil can flow. Sand suspended in the mush keeps the cracks from closing again. After the rocks are split, a liquid chemical may be pumped into the well. It breaks the mush into a liquid again and the gasoline flows out of the well with the oil.

The new method is expected to help petroleum engineers solve one of their major problems. This is opening up rock formation so that oil can flow to the well-holes. The method should prove of particular value in the recovery of oil from formations too "tight" for an economical oil flow. By means of it many abandoned wells may be put into operation again.

The new process, to be known as the Hydrafrac method, was explained to the engineers by J. B. Clark of Stanolind's Tulsa research laboratories. It was developed particularly for use in sandstone formations, but it will also work in limestone in which an acid is used to eat holes in the rock. This acid process has not been found satisfactory for use in sandtone formations, and it is in sandstone formations that more than half the oil wells of America are producing.

FOSSILS OF EARLY MAMMALS BROUGHT TO SMITHSONIAN

WASHINGTON, Oct. 11 — Fossils of animals that lived in Eocene time, the dawn period of the Age of Mammals, have been brought back to the Smithsonian Institution by Dr. Charles L. Gazin, who spent the summer digging for them in western Wyoming and Montana.

Included in the collection is an excellent skull of the little eohippus, the terrier-sized horse that had individual hooflets on each of its separate toes. To zoologists this animal is known as Hyracotherium.

Another notable find is the skeleton of an animal about the size of a sheep. Although it had clawed feet, it is believed to be distantly related to the hoofed animals of the present time. Its scientific name is Meniscotherium.

Near Pipestone Springs, Mont., Dr. Gazin worked in deposits of the second major period of mammalian time, known as the Oligocene. Here he found bones of numerous small animals, forerunners of present-day rodents, dogs and cats, moles and shrews. Most familiar fossils of this age are those of huge, rhinoceros-sized beasts; good fossils of small Oligocene mammals are much rarer.

MAN-MADE UNDERGROUND EXPLOSION SHOCKS MEASURED BY NEW INSTRUMENT

SCHENECTADY, N. Y., Oct. 11 — Man-made shock waves passing through the earth, resulting from underground explosions set off by engineers in connection with large construction projects, are accurately measured in velocity and acceleration by a new instrument revealed here today by General Electric.

The instrument is so designed that it can be buried near the scene of test explosions. It can register shocks up to 1,500 times the force of gravity, and as many as 10,000 impulses per second. The device, the size of a can of baby food, contain crystals which generate a voltage when stresses are applied to them. Signals from the crystals are carried through cables to amplifiers and recorders above ground.

In a recent test of four of these instruments, they gathered data on what sorts of shocks occur 130 feet below 500,000 pounds of high-explosives. The giant explosion was made on the site of Watauga dam, Tenn., to be constructed by the Tennessee Valley Authority.

CORAL REEFS CONTAIN WAX-LIKE SUBSTANCE THAT MAY BECOME PETROLEUM

CAMBRIDGE, Mass., Oct 18—Coral reefs in distant waters may some day contribute to the petroleum supply — but not in time to help present shortages. It will be crude oil for future eons which may be hundreds of thousands of years from now.

It is the tiny animals that form coral reefs that are manufacturing the petroleum, drop by drop, the American Chemical Society was told here by Profesor Werner Bergmann of Yale University. Stony coral, he said, contains minute amounts of a wax-like substance which apparently becomes entrapped in the ever growing reefs.

It would require only a relatively minor geological change to bring about a distintegration of the reef, and only a slight rise in temperature to liquefy the waxy material and bring it together.

It is not inconceivable, therefore, that some coral reefs of a very distant past have contributed to the formation of present-day petroleum, and that present reefs, such as the Great Barrier Reef near Australia, are accumulating material for the formation of petroleum in a very distant future.

The wax, which makes up about one seventh of one percent of the coral, consists largely of hydrocarbon and complex alcohols, chemicals similar to those in petroleum.

A ten-year study of more than 100 different species of lower forms of marine life has revealed that the fats of sea-dwelling animals contain an unusually high amount of unsaponifiable fats, or fats that cannot be converted into soap by treatment with caustic alkali. As a rule, he stated, the more primitive the animal, the higher percentage of unsaponified material in the fat. This is an important fact, the biochemical significance of which is not yet clear.

SCIENTIST "BUILDS" ANIMAL TO FIT PUZZLING FOSSIL TRACKS

BERKELEY, Oct. 16—An accurate picture of weird beasts that trod the earth about 200,000,000 years ago, leaving perfect footprints on mudflats but apparently no skeletal remains, has been drawn by Dr. Frank Peabody, working in the paleontology laboratories of the University of California.

The beasts were a group of animals that ranged in size from a chicken to a dinosaur-like animal standing six feet high at the hips. The family name of Chirotherium has been given to the entire group. The name means "hand animal," because of the remarkable resemblance of the hind foot to the human hand.

How a body of scientific evidence was built up, from which Chirotherium's appearance was deduced, on the basis of the beast's "fingerprints," is recited in a new University of California publication by Dr. Peabody, who is now at the University of Kansas. In the course of his eight-year study he was able to set up criteria for determining the anatomical characteristics and general appearance of any animal on the basis of its tracks alone.

Dr. Peabody began his studies in 1938, when he was a member of a paleontology party from the University working in the sandstone beds of the Meteor Crater region of Arizona. Several trackways of Chirotherium were included in the material.

Dr. Peabody, then a graduate student, became interested in these tracks, and devoted all his graduate work to their study.

He soon found that while many studies had been made of individual tracks of Chirotherium and other animals, no systematic work had been done on a trackway, that is, three or more consecutive steps.

So he began several years of painstaking work by studying the trackways of all living salamanders. He took trackways of salamanders in their usual environment, and he made the animals walk across smoked paper and laboratory mudflats.

He analyzed the characteristics of the foot, the length and width of stride, orientation of feet, tail marks. He studied a number of other factors, such as what he calls pace angulation, the angle formed by three consecutive steps.

As a result, he found that he could establish criteria by which he could classify all living salmanders on the basis of trac no ways alone, determining their size, length of body, height, weight, etc. His next step was to compare living salamander tracks with 20,000,000-year-old fossilized salamander tracks taken from an old gold mine in the Sierra Nevada. He found no sigificant changes in salamanders during the past 20,000,000 years. He extended his studies to living mammals and reptiles.

Using the "yardsticks" he had established with living and recent animals, Dr. Peabody began to work in earnest on Chriotherium. With the help of his colleagues, he excavated more trackways from the Painted Dessert of Arizona.

The end result was a verification of the reconstruction of Chirotherium by a German scientist, Wolgang Soergel, though Dr. Peabody's conclusions were based upon more solid evidence than had been available before.

Dr. Peabody's studies have made it possible to predict more accurately what the skeletal remains of Chirotherium should be like, so that scientists will be able to identify them more easily if its bones are ever found.

METEORITE WEIGHING 1,164 POUNDS SHOWS DEPRESSIONS PROBABLY CREATED OUT IN SPACE

WASHINGTON, Oct. 18 — A meteorite weighing 1,164 pounds, the eighth largest rock known to have crashed through our atmosphere and landed in the United States, has been found to have some unusual features.

Deep depressions on the surface of this piece of iron from the heavens probably existed before the meteor became trapped in our atmosphere, E. P. Henderson and S. H. Perry of the Smithsonian Institution state.

The so-called Drum Mountains meteorite from Utah was discovered by chance four years ago by two Japanese from a neighboring relocation center set up for enemy nationals during the war.

These two, Yoshio Nishimoto and Akio Ujihara, were conducting classes in gem cutting for the internees. Exploring the countryside for materials suitable for classroom demonstration, they came upon a large rock protruding about two feet above the ground. Thinking the rock unusual, Mr. Nishimoto chipped off a piece and sent it to the Smithsonian. The complete rock has since been brought here and examined.

The surface of iron meteorites frequently show broad, shallow depressions, popularly known as "thumb marks." This iron has deeper depressions, unrelated to the so-called thumb marks, also observed on some other iron meteorites.

These depressions in the past have been explained by some as due to weathering or rusting out of some constituent after the meteorite landed. Others reported them due to the burning out of troilite, a sulfide of iron, during its flight through the earth's atmosphere. Mr. Henderson and Mr. Perry interpret these markings as ones created in cosmic space, before the meteorites entered our atmosphere.

The meteorite was found resting almost entirely on the surface of the ground. L. B. Aldrich, director of the Smithsonian Astrophysical Observatory, estimates that this 1,164-pound meteorite must have struck the earth with a force of at least 20,000,000 foot-pounds. Yet no crater was found in the formations in which the iron was discovered, and the surface of the meteorite is surprisingly free from any evidence of an impact as great as this. The meteorite possibly fell some distance from the point where it was found, and either bounced or rolled to the place where it finally came to rest. Or its impact with the earth may have been cushioned by deep snow or loose sand.

LEADING EGYPTIAN SCIENTISTS ASSISTING AMERICAN EXPEDITION

NAIROBI, Kenya, Oct. 18—Two leading Egyptian scientists, Prof. Gelal Hafez Awad and Prof. Mohammed Mitwally, both of Farouk I University at Alexandria, have been participating in the work of the University of California African Expedition, with field headquarters here.

Prof. Aawad, a geologist, has made extensive collections of specimens and field studies in Kenya and on the island of Zanzibar, where special facilities were made available by the Sultan. Especially good hunting was found among fossils of ammonites, which were coil-shelled distant cousins of the present-day pearly nautilus that lived some 200,000,000 years ago.

Prof. Mitwally, an anthropologist, made physical measurements of more than 1,200 African natives, representing nine different tribes and racial groups, over territory ranging from Zanzibar to Lake Victoria. Among the people on whom records were obtained are Jaluo, Bantu, Kavirondo, Kikuyu, Kamba, Nandi, Digo, Giriama and Zanzibarese.

400-YEAR "LOST" PERIOD IN INDIAN PREHISTORY FILLED

CHICAGO, Oct. 23 — The 400-year "Dark Ages" period in European history, stretching from the fall of Rome to the beginning of the Middle Ages, had its counterpart at about the same time in the prehistory of an important Indian culture. This gap between A. D. 500 and 900 in the known story of the long-vanished Mogollon Indians of the Southwest has been filled in by discoveries made in New Mexico during the past summer, states Paul S. Martin anthropologist of the Chicago Natural History Museum.

Previous excavations of the archaeological traces of the Mogollons had shown stages in their cultural evolution from a nomadic hunting people to dwellers in snug pit-houses—in effect, roofed-over cellars. This stopped abruptly at A. D. 500 and took up again at A. D. 900.

The diggings described by Mr. Martin turned up new pit-houses in which the Mogollons lived during the hitherto unknown interim. They were deep, rectangular excavations, with long, stepped-up passage-entryways facing east. Cupboards cut into the earthern walls were used for storing supplies, instead of pits in the floor in the earlier houses hitherto known.

Dishes and kitchenware, represented by pottery fragments, also show an advance in culture. The rather unattractive brown ware found in the older pit-dwellings is replaced by more delicately wroght, pleasingly decorated utensils. The Mogollons were beginning to be civilized.

CRYSTALS WITH ATOMIC "HOLES" MAY BE USEFUL

Crystals which have too few or too many atoms inside their atomic framework may have especially desirable qualities.

M. E. Straumanis of the University of Missouri School of Mines, Rolla, Mo., told scientists at the International Congress of Crystallographers that many crystals vary from the ideal crystal which has just the right number of atoms in it to fill up its lattice or framework.

Crystals with "holes" in them where atoms are missing conduct electricity much better than "ideal crystals." Extra atoms, located between the normal positions of atoms in the lattice, give greater mechanical strength to the metals that contain them.

Using very precise and delicate experimental methods, he said, it is possible to determine by molecular weight whether a given material has too many, too few or an ideal number of atoms.

The elements silver, copper, iron, lead and tellurium and some compounds have ideal crystal structures with the exact number of atoms expected.

Grass-roots of the Geological Science

(A speech delivered at the convention dinner of the Midwest Federation of Geological Societies, August 21, 1948, LaSalle Hotel Chicago.)

GILBERT O. RAASCH

Illinois State Geological Survey

It is a heart-warming experience to be among you, and to have been invited to speak to this fine group of people, who have embraced geology, not as a means of making a living, but purely for love of the science. I regard it as a signal honor. It is a heart-warming experience, because as a boy who ate and breathed geology, I was lonely. Among the hundreds of thousands in the great city where I spent my boyhood, there was probably not a single amateur geologist, — and only one professional. Without the support and encouragement of this single individual I might never have had the courage to go on into the science.

What a difference in that city, and everywhere, today! That difference, that new and spontaneous rebirth of enthusiasm for the Science of the Earth, has never been more concretely expressed to me than tonight as I look about this room and see so many representatives from the far-flung states of our rich inland empire.

From the day I took my first position in geology, as a high school boy in 1919, down through the long years up to the last war, it had been my good fortune to be permitted to carry on fundamental research and to come to know well the leaders of my profession. But still, through those long years of professional achievement, there was another kind of loneliness. We professional scientists seemed to be walled in our ivory towers, and shut off from the world by an enveloping fog of public apathy and indifference.

That oppressive fog began to thin before the war years, and when I returned from military service abroad, to resume my chosen profession, the fog had melted away. Outside the ivory towers people were calling to those within to come out and share their knowledge and their labors.

To this call from the public, outside the profession, the Illinois State Geological Survey did not turn a deaf ear. And remembering my lonelier years, I was willing to set aside my research to come outside and meet the amateur and to invite him to come in and sit down.

Through the earlier decades of our century the Geologic Science was almost exclusively the preserve of professional geologists. Too many times they met public apathy with intellectual snobbery. Too many of them forgot that in the beginning, in the early years of the 19th Century, when geology first emerged as a true science, *all* geologists were amateurs.

They were miners, or country gentlemen, country doctors or clergymen. Sometimes they were called to seats of learning, but they made the schools,—the schools did not make them. They grew as geologists among the grass roots of the field. From the earth they got their strength, strength needed to see new truths and to clear away the tangled rubbish of outworn dogmas.

The tree of geologic knowledge has grown to immense proportions since their day; it was branched and rebranched into ever new divisions of the science. But its roots, too, must remain sound and penetrate ever deeper into the sustaining terrain.

In a democracy such as ours, most of the institutions which sustain the geologic science are supported by the people and exist as an expression of the will of the people. A healthy amateur movement is the essential link between the profession and the public.

But the Science has more direct need of the non-professional. There is much work to be done and never enough professionally employed geologists to do it. Moreover, because it is easier to justify the expenditure of public funds for types of geologic work that are of immediate practical advantage, the fundamental side of geology exists on close to starvation diet. Yet applied science is but the fruit of the tree of fundamental science, and America cannot starve the tree indefinitely and expect to go on harvesting the fruit.

Here is where the amateur can come to the aid of the science, for he is answerable to no one, and he takes his reward in the joy of his hobby, not in cash.

The great paleontologists in the latter half of the 19th Century, although active field men themselves, depended on scores of amateur collectors at strategic points about the country for much of their material. It was a sensible division of labor. The professional had to cover perhaps half a continent, and could spend only a little time in any particular place. The private collector could spend all his free time, year after year, in a single productive locality, if he chose. As a result, he had it all, the rare as well as the typical.

Some of the great paleontologists of that time, in fact, were men of independent means who were nonprofessionals; others began their research and writing as amateurs and were later awarded positions, some with, some without, remuneration. An outstanding case is Frank Springer, a railroad executive, who became one of the world authorities on fossil crinoids and built the world's largest collection of these fascinating organisms. His collection is the pride of the United States National Museum, whither he retired in his later years and was given a private laboratory to carry on his studies

No license is required to practice in the various branches of the geologic science; nor is scientific recognition reserved exclusively to professionals.

Of course, an amateur has a hobby to enjoy it; he has no obligation to produce, to contribute to scientific knowledge. It need not bother his conscience if he produces nothing of lasting value. I can think of only one obligation that is laid onto all those who take rare and beautiful things from the earth. It is their duty to preserve them properly, and to record data of locality without which these treasures are worthless. Moreover, if the specimens are in demand for scientific research in progress, it is only ethical to make them, or at least a replica of them, available to the person who is doing the work. I regret to say that in the past, professionals have been more guilty than amateurs of a "dog in the manger" attitude. This attitude, fortunately, has largely disappeared today, as men have come to realize that science cannot progress without the free interchange of information.

Everyone is in a position to contribute directly to the science of geology. You have but to recognize a problem when you see one, — they are everywhere, — and, if you want to go very far in research, you must, sooner or later, conquer the scientific language.

After all, it is no harder than French, or Spanish, or German. The best way to learn any language is not in the classroom, but by use. Pick up the publication on the area nearest your home, take it in the field to the spots it describes, and read the description of outcrops or structures. When they are before you, they will explain the words, and you will have made a proper beginning toward learning a new language. Or take a fossil or a mineral of known identification, and read its description; the specimen will explain the words. I know it can be done, because that is the way I did it as a grammar school boy.

As to problems, you all come from so many places that it is hard to be specific before this audience. But, for instance, is there an outcrop map of your county? Has a list of its fossils, or its minerals, or its rock types, ever been prepared? Well, that is all the start required; from that simple beginning, geological problems will radiate and multiply until they cover the whole earth.

For in your county, in these simple beginnings, are the grass roots of geology.

Do the professional geologists welcome the amateur geologists into the fold? Well, they had better. They cannot get along without them.

(Ed. note: The Illinois State Geological Survey has accomplished a great deal in the popularization and advancement of the geological sciences. Dr. Raasch is Associate Geological in Charge of the Educational Extension Division. We recommend the following publications of the Survey to those interested in geologic education: "What About Our Minerals?A Quiz Book on the Geology and Mineral Resources of Illinois" [Circular No. 124]; "Why Study Geology—Covering Old and New Ground" by M. M. Leighton, Chief, Illinois State Geological Survey [Circular No. 140]; and "The Educational Extension Program of the Illinois State Geological Survey" by Gilbert O. Raasch [Circular No. 142].)

NEW LIGHT ON SUB-OCEAN GEOLOGY

Giant Mountains and Canyons Discovered Under the Oceans

MARTHA G. MORROW
Science Service Staff Writer

Davy Jones is beginning to tell some of his secrets. For instance, scientists recently have learned that:

The Gulf Stream, considerably narrower and swifter than previously supposed, meanders like a great river.

Soft, unconsolidated sediment, 3,000 feet thick in places, has been found to overlie the solid floor of the ocean in some regions.

The auxiliary ketch Atlantis is the pride of the privately-endowed Woods Hole Oceanographic Institution at Woods Hole, Mass. Recently a hitherto uncharted mountain rising 6,000 feet above the ocean floor east of Bermuda was discovered by scientists sailing the Atlantic in this ship, one of a fleet of eight boats belonging to the institution.

Floating Laboratory

The chief floating laboratory of the Scripps Institution of Oceanography of the University of California at La Jolla, Calif., is the E. W. Scripps, formerly a movie star's luxury yacht. Three additional vessels are being equipped to supplement this craft; two are ex-Navy vessels, one a former fishing boat.

Cruising the Pacific Ocean, the E. W. Scripps has been instrumental in exploring deeply-submerged mountain peaks and ocean-covered canyons with sheer walls a mile or so high. One of these, off Monterey, Calif., is larger than the Grand Canyon.

As man cannot lower himself to the depths these ocean experts wish to explore, a number of ingenious devices have been constructed for sampling the ocean.

A string of Nansen bottles, such as this being lowered from the E. W. Scripps, of the Scripps Institution of Oceanography, is used to obtain samples of sea water at different depths.

Photo by Science Service

One of the newest instruments as well as the most intricate records simultaneously the temperature and degree of saltiness of sea water, and the depth at which the instrument is operating. Connected to a recorder in the ship, it makes possible rapid determination of those variables vital to establishing surface and sub-surface ocean currents. The device cannot, however, be lowered more than several hundred feet.

Samples of sea water, to be

analyzed for iron, oxygen, salinity and alkalinity, are collected in Nansen bottles. In operation a half-dozen or so of these metal tubes, with both ends open, are hooked to a wire at pre-determined intervals.

When the bottles have reached the desired depth in the ocean and sufficient time has been allowed for their accompanying thermometers to record the water temperature, a small weight is sent sliding down the wire. This "messenger" starts a chain reaction which closes and inverts each bottle, and breaks the mercury thread in such a way that the temperature of the water at various depths can be read later.

The bottom of the ocean is explored in a number of ways. Solid samples of sediment, for instance, are grabbed by an "orangepeel" dredge. Lowered with its jaws open, when it reaches the bottom this instrument automatically closes.

Ocean Bottom Cored

Cores are punched from the ocean bottom in much the same way that an apple is cored. Allowed to fall free as it nears the bottom, the coring tube is driven into the sediment by ballast, weighing up to 1,000 pounds.

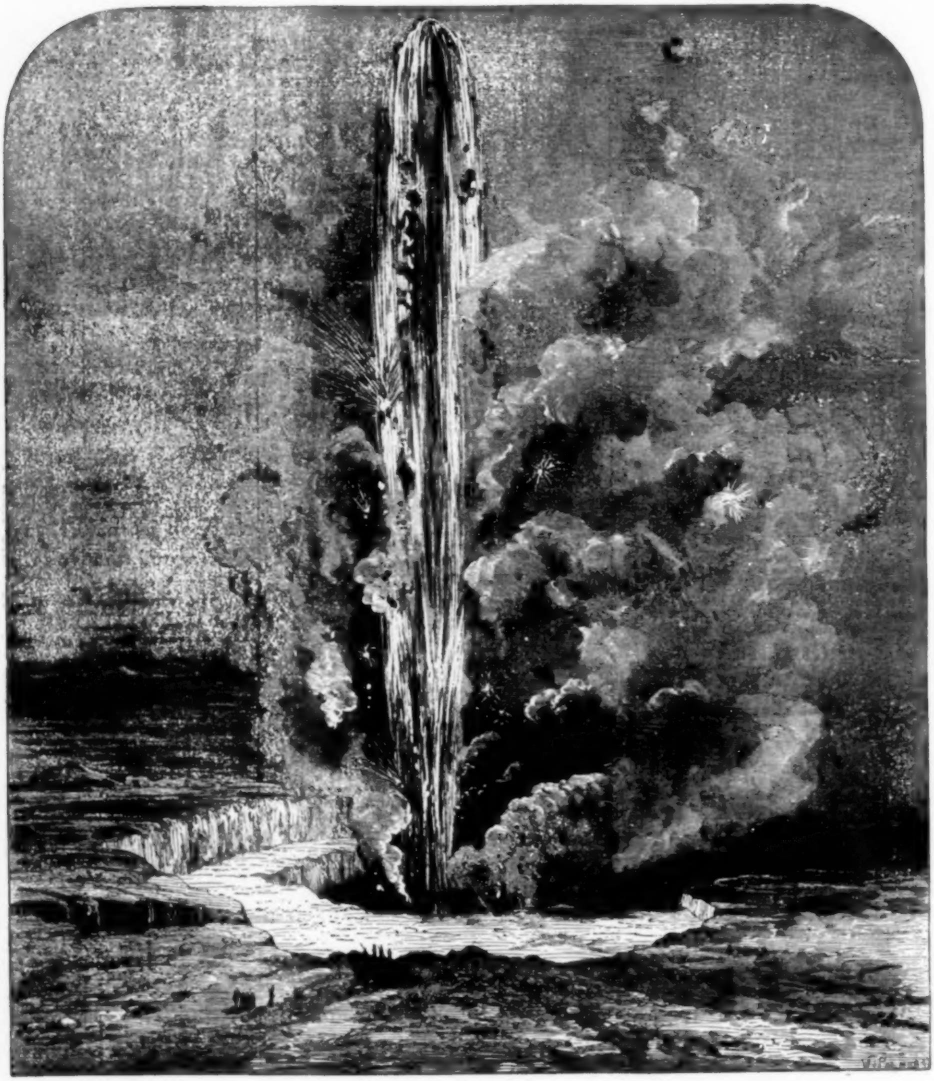
One instrument stamps out short cores three feet long, another brings up sections up to 15 feet in length. The thin cross-section of sediment it brings up enables us to trace a million or so years into the history of the ocean, and of the world. From the remains of microscopic animals once living in the ocean, scientists can tell at what period the water was shallow, at what time deep; when warm and when cold.

Long cores of sediment up to 72 feet were obtained recently by a Swedish expedition on the research vessel Albatross. This instrument utilizes the high water pressure at great depths to force the sediment upward into the tube, while the tube in turn is pressed into the sediment by a heavy weight. Within the last few weeks a core measuring 30 feet 10 inches was secured by American oceanographers.

A trick used by oil geologists on land has been adapted to the sea. The thickness of the sedimentary carpet underneath the ocean can be determined by exploding a small bomb astern the ship. The first weak echo of the explosion is returned by the top of the sediment, the second strong one comes from the firmer rockbed beneath. Since sound is assumed to travel through the sediment 4,500 feet a second, the thickness of the sediment can be estimated by recording the time interval between the two echoes.

VOLCANIC ERUPTIONS IN HAWAII

We are pleased to bring this interesting account of Mauna Loa to the attention of our readers. This article originally appeared in the Illustrated London News of December 14, 1872. The illustration of the eruption of Mauna Loa is by W. J. Palmer.



At the end of last August an old missionary of Hawaii, the excellent Titus Coan, wrote to Mr. Dana, the American geologist, that another eruption of Mauna Loa had taken place. A vast cloud of fiery vapour rose above the lofty volcano; at times it formed a magnificent column at least 2000 feet in height. Though seen at the distance of many miles, the changes of this illuminated pile were distinctly apparent. It was, indeed, a glorious sight when the head expanded and spread out a palm-tree of fire. Mr. Coan is now beyond his three score years and ten; but this ardent Christian philosopher would have mounted the snowy heights, as he had often done before, but for sickness in his family. Another, however, gained the summit and told the tale.

Mauna Loa, almost 14,000 feet above the level of the sea, is one of the many volcanic peaks of that Iceland of the North Pacific, Hawaii; but this, the largest of the Hawaiian or Sandwich group of islands, instead of being like its fiery rival near the frozen zone, is fanned by the voluptuous airs of the tropics. It is but one eighth the area of Ireland, though a very Switzerland of mountains and valleys. The well-known port of Honolulu, half way between China and California, is in the neighboring smaller volcanic island of Oahu.

Eruptions have been so numerous and on so magnificent a scale in Hawaii, that the attention of geologists has been much attracted towards it since Captain Cook, its discoverer, was murdered at the foot of one of its basaltic cones.

Among the many hundred peaks from which the fiery current has flowed none has been so celebrated in modern times as that of Mauna Loa. The highest point is 13,950 feet above the sea. It is, however, a double mountain, the loftier peak being Mauna Kea. This has nine cones about its top, while Loa is but a single dome. Upon the side, though 10,000 feet below, spreads out the largest burning crater in the world—Kilanea. In that crater 3,000,000 square yards are sunk nearly 1000 feet below the rim of the crater. A number of boiling cauldrons are perpetually hissing there with their bubbling lava, which has repeatedly overflowed, to the devastation of whole provinces around.

It was in this lofty seat of Plutonic fury that the goddess Pele was fabled to dwell. Whenever the Hawaiian devotees neglected their offerings or otherwise incurred her displeasure she would cast forth storms of stones and ashes, pour out rivers of lava, and shake the country with earthquakes. She had brothers and sisters with her in this pleasant palace. Among these were the king of steam, the rain of night, the thunderer, the fire-child of war, the cloud-holder, and the fiery-eyed canoe-breaker. Tradition says that a monster hog came out of the sea to court the fair lady of Kilanea. As she declined his tender proposals, he grunted out his displeasure in a furious discharge from the ocean. But the goddess replied to his gallantry by such a deadly rain of fire as drove back the very waves of the raging sea, and sent Tampuaa in hasty retreat to the quiet sea caverns below.

One of the first Christian converts was a Princess of the island. As the natives feared to accept the new faith of the missionaries from a fear of Pele, the brave Kapiolani resolved to break the charm. She walked up to the dreaded home of Pele, on Mauna Loa, and on the brink of the yawning chasm dared the goddess to come. She called upon her, in the name of Jehovah, to appear in all her fiery horrors, and assault, if she dared, the champion of the Cross. There, below the heroine's feet,

The fiery jets, fierce bubbling, chase each other
Like flame-maned coursers on their track,
Then disappear, lost in the raging gulf;
Ever with northward flow the current sweeps,
Crackling and sparkling in red fissures deep,
As the cooled surface breaks, like fields of ice,
And dark red lava heaps in fiery drift.

But Pele resented not this invasion of her domain, nor punished the daring speaker. Around, at a distance, stood the trembling, weeping natives, entreating earnestly for their mistress to return. She called out aloud,

"I will descend into this crater, and if I do not return safe then continue to worship Pele; but if I come back unhurt you must learn to adore the God who created Pele."

The beautiful Princess then descended 1000 feet below, into the very bowels of Mauna Loa. She stood beside the lake of fire. She cast in the sacred berries which it had been thought death to hold there. She contemptuously stirred with a stick the sluggish, surging mass, and laughed at the power of Pele. She returned to her home in triumph, and her heroic act was the conversion of many a heathen soul.

Above this terrific scene of volcanic violence rises the snow-crest of Mauna Loa. Eruptions are less frequent from the summit than from the crater at its side. But in 1843 a current of lava poured forth from it. This was repeated in 1852, though the point of issue was 4000 feet below the top. In 1859 a stream ran fifty miles before it leaped over a mighty cliff into the ocean. When first it burst from the womb of the mountain it formed a mighty arch of fire 250 feet in height, and then rolled down in a succession of wonderful cascades from crag to crag. In 1868 a dreadful eruption took place. Earthquakes of frightful energy shook the whole island. In ten seconds every building in a whole district was overthrown. A smiling valley, in which a flourishing village was nestled and large flocks and herds were depastured, suddenly threw forth a vast volume of boiling, hot mud, and soon after that a flood of cold water. Along the coast the sea rose and fell, to the desolation of several villages.

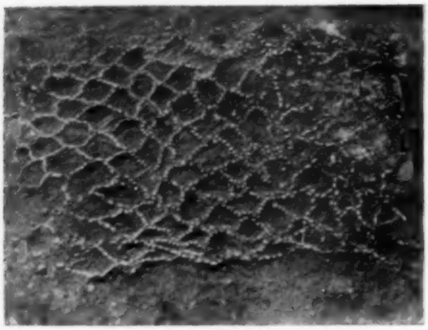
In August and September of this year a still more wonderful eruption took place on Mauna Loa. On the huge platform, four times the height of Vesuvius, are two large craters, and two much smaller ones. The two former are Mokuaweoweo and Pohakuohanalei. The first is that which was convulsed last year. One who visited it in quieter times described the crater walls as being 470 feet deep on one side and 784 feet on the other. As many as seventy distinct layers of basalt were counted in one part. Dr. Judd descended the nearly perpendicular wall to the bottom. There he had to walk over ridges of clinker and basalt, running from 10 feet to 50 feet high, which took him two hours to cross. Here and there he noticed stupendous caverns, lined with the delicate fibres of volcanic matter, called Pele's hair. This hung about like cobwebs. Yet the crater was so still and peaceful that he ventured to plant some orange seeds in the moist and rich soil, in the hope that future visitors might gather the luscious fruit there.

The last visitor to Mokuaweoweo has another tale to tell. He could trace the oval crater three miles round. He could see the floor on which Dr. Judd had trod in safety. But a portion of this had given way, perhaps 100 feet below. In one part of this depressed basin was a pool of fire. It was from that he saw this singular column rise. He calls it "a magnificent fountain of liquid lava, about 75 feet in diameter, that sent its volume of brilliant, sparking, molten matter to a height estimated at 500 feet in a compact and powerful jet."

As he looked downwards and across, at a distance of three quarters of a mile, he saw that the fountain formed an arch. The fiery current rose in a slightly slanted direction, so that the mass fell perpendicularly in the descent. The roar of the flames was as the sound of a heavy surf upon the shore. But the fountain carried up with it enormous masses of white-hot rock. "These," he says, "as they fell and struck upon the black surface of the cooling lava, burst like meteors in a summer sky." He compares the report of these explosions to the heavy rush of ponderous waves against the rock-girt shore.

At night the sight was glorious indeed. The column still rose from the burning lake. Fiery falls were seen along the course of the flaming river below, while the fiery foam swirled round the waves of this terrific cauldron.

Early Baby Blanket Found



A prehistoric Indian baby blanket (above), extensively decorated with shell beads, has been discovered in a cemetery built by the Hopewell Indians near Frankfort, Ohio. Round and barrel-shaped beads of three sizes were used in a well-defined pattern of joined diamonds.

The blanket, uncovered at Ater Mound, was probably made of a loosely woven fabric. Scraps of such a fabric were found attached to a copper breastplate under the head of the baby skeleton covered by the blanket.

The regular positions of the beads indicates that they were strung before being attached to the blanket. Over 1,500 beads were used to decorate the miniature blanket, two feet six inches long by one foot ten inches wide.

The diamond pattern is duplicated at the top and bottom of the blanket. It consists of two and a half rows of diamonds, approximately two and a half inches long and not quite so wide. The diamonds are made of small tubular shell beads, larger tubular beads are at each corner. The central portion consists of small round shell beads with larger round beads at the diamond corners.

This rare example of the blanket work of prehistoric Indians was found during excavations conducted by the Ohio State Archaeological and Historical Society. It was carried out by Raymond S. Baby under the supervision of Richard G. Morgan. By using a thin mold of modeling clay, the beads were removed from the burial ground in the exact position in which they were discovered.

New Books

BIBLIOGRAPHY AND INDEX OF GEOLOGY EXCLUSIVE OF NORTH AMERICA #12 (1947). $3.50. The Geological Society of America, 419 West 117 Street, New York 27, New York.

BIOGRAPHY OF THE EARTH — by George Gamow. A pocket book edition of this interesting book. 194 pp., 62 illustrations, 28 plates, 35c. New American Library of World Literature, Inc., 245 5th Avenue, New York 16, New York.

CATALOGUE OF TOPOGRAPHICAL MINERALOGIES AND REGIONAL BIBLIOGRAPHIES — by L. J. Spencer. About 300 pp., 12s. This booklet lists all the important articles and publications on minerals and mineral localities of the world. The Mineralogical Society, British Museum, Cromwell Road, London, S. W. 7, England.

DIRECTORY OF THE CALIFORNIA FEDERATION OF MINERALOGICAL SOCIETIES, INC. 126 pp., $2.50 A listing of 3370 names and addresses of California earth scientists. This book may be purchased from Carl A. Noren, Rt. 3, Box 312, Fresno, Calif.

EARLY DAYS OF OIL: A Pictorial History of the Beginnings of the Industry in Pennsylvania—by Paul H. Giddens. 150 pp., illustrated, $6.00. A beautifully illustrated work, of especial interest to those interested in the history of petroleum geology. Princeton University Press.

FIRST SUPPLEMENT 1948 BIBLIOGRAPHY OF THE GEOLOGY AND NATURAL RESOURCES OF NORTH

DAKOTA—by Chrissie E. Budge. 90 pp., free. North Dakota Research Foundation, Bismarck, N. D.

PUBLICATIONS OF THE CALIFORNIA STATE DIVISION OF MINES (To September 1, 1948). 92 pp., free. California State Division of Mines, Ferry Building, San Francisco 11, Calif.

CALIFORNIA JOURNAL OF MINES AND GEOLOGY, VOLUME 43 (1947). 502 pp., 43 pls., 1 map, 9 figs, $3.00 (cloth-bound volume). This volume contains the following articles:

Walibu Quicksilver Mine, Kern Co., Calif.

Mines and Mineral Resources of Lake Co., Calif.

Mines and Mineral Resources of San Benito Co., Calif.

Condenser Installation at the new Idria. Quicksilver Mining Co., Idria, Calif.

Information in Regard to Mining Claims on the Public Domain.

Mineral Patents.

Mines and Mineral Resources of Stanislaus Co., Calif.

Vanadium.

Fifty Years of Operation by The Mountain Co., Ltd., in Shasta Co., Calif.

Status of Topographic Mapping in the United States.

Limestone in California.

Annual Report, Division of Mines, for the 98th Fiscal Year.

Mines and Mineral Resources of Siskiyou Co., Calif.

Silver.

Pumice.

California State Division of Mines, Ferry Building, San Francisco 11, California.

THE FLINT RIVER SITE—by William S. Webb and David L. DeJarnette. 87 pp., illustrated, $0.06. A report on the shell mounds along the Tennessee River in Alabama. Alabama Museum of Natural History, University, Alabama.

RECENT PUBLICATIONS OF THE GEOLOGICAL SURVEY OF CANADA

PHYSIOGRAPHY OF THE CANADIAN CORDILLERA, WITH SPECIAL REFERENCE TO THE AREA NORTH OF THE FIFTY-FIFTH PARALLEL — by H. S. Bostock. (Memoir 247) 25c.

PHYSIOGRAPHICAL SUB-DIVISIONS OF THE CANADIAN CORDILLERA; lat. 55-00 to 70-00; long. 120-00 to 140-00; scale 1 inch to 40 miles, geology. (Map 922A) 25c.

(Note: This map is contained in the above memoir and is also available for separate distribution).

MISCELLANEOUS CLASSES OF FOSSILS, OTTAWA FORMATIONS, OTTAWA—ST. LAWRENCE VALLEY, ONTARIO — by Alice E. Wilson. (Geological Survey Bulletin No. 11) 25c.

(Note: Bulletin No. 4, on the Ecchinodermata of the Ottawa formation, and Bulletin No. 9, on the Trilobita of the Ottawa formation, by the same author, are available at 25c each.)

THE MIDDLEPORT PREHISTORIC VILLAGE SITE — by W. J. Wintemberg. (Museum Bulletin 19) 25c.

(Remittance on the above publications should be made by Postal Note or Money Order (Canada); Postal Money Order (United States); or British Money Order, drawn payable to the Receiver General of Canada.)
Geological Survey of Canada
Department of Mines and Resources
Ottawa, Canada

VOLCANO ERUPTS AFTER 77 YEARS

Hibokhibok volcano, located on tiny Camiguin Island in the Philippines, began erupting for the first time since 1871 on September 1. Tearing a huge hole in a mile high mountain peak, the volcano threw smoke and ashes up to a height of 18,000 feet at half-hour intervals.

Arturo Alcaraz, volcanologist at the Weather Bureau, stated that the present crater is located about 1.8 miles east of the crater formed in 1871.

Forty thousand natives have been evacuated from the island, which has a population of 55,000. Although hot lava has been flowing steadily down the mountain, no deaths as yet have resulted, although one man had been caught in the lava flow.

The present activity of Hibokhibok volcano may continue for some time.

"PETRIFIED POTATOES"

Horace G. Richards
Academy of Natural Sciences
of Philadelphia

Several times during the past few months people have come to my office to ask questions regarding "petrified potatoes" that they had found in bags of this vegetable that they had purchased at the corner grocery.

In all cases they turned out to be quartz pebbles the exact size, shape and color — but not the weight — of an ordinary potato. Some of them even had "eyes" similar to those of a regular potato.

A typical "petrified potato".

Apparently some unscrupulous potato dealers are gathering these pebbles and including one or more of them in bags of potatoes that they sell to the markets. The extra weight of these "petrified potatoes" brings an extra profit.

The best thing to do with one of these specimens is to include it with a collection of pseudofossils, those objects which look like fossils, but which really are of inorganic origin, such as certain types of nodules, concretions and the like.

NEW CATALOG ISSUED BY SCHORTMANN'S

An attractive sixty-three page catalog of selected mineral specimens is being distributed by Schortmann's Minerals. It also includes listings of crystals, fluorescent minerals, book, Mineralights, and other items for the collector.

For your copy, send 25c. to Schortmann's Minerals, 10 McKinley Avenue, Easthampton, Mass. Your payment will be refunded on your first order of $2.00 or more.

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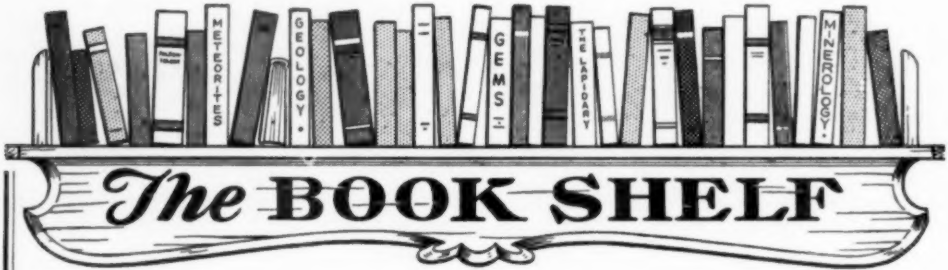

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